The EXCAVATING ENGINEER

Vol. XXI APRIL 1927 No. 4

The Garza Dam Project

A Description of the Excavation and Construction Work for Garza Dam. A Structure that Gives Dallas, Texas, an Additional Water Supply of 63 Billion Gallons

FOR the past several years the city of Dallas, Texas, has felt a pressing and urgent need for an additional water supply. Before the completion of Garza Dam her supply came from the Elm Fork of the Trinity River when there was any flow, from White Rock reservoir, a small storage basin with a capacity variously estimated from four to seven billion gallons, and from deep wells. These sources proved to be despairingly inadequate, and it was necessary to take action to secure a more adequate supply.

Various reservoir sites and other sources of supply had been recommended by different engineers, laymen, and civic bodies as an additional water supply. In July 1923 definite plans were started. Nagle & Thompson were employed as consulting engineers to make a study of the entire field and select the best that could be had for five million dollars. They started work on August 1, 1923, and submitted their report January 17, 1924, recommending the Garza site. Surveys and borings for final plans and estimates were started April 1, 1924, and contract was let on August 15, 1924, to the W. E. Callahan Construction Co. of Dallas, Texas, who sublet the hydraulic fill to the Puget Sound Bridge and Dredging Company of Seattle. Work was started immediately and it is expected that the last finishing touches will be put on and the dam ready for use some time in May 1927.

Dimensions of Dam and Yardage Involved

The dam is located about 30 miles northwest of Dallas on the Elm Fork of Trinity River. It is about two miles long and of the hydraulic fill type. The maximum height is 80 feet, with side slopes of 3:1. The top width is 30 feet and carries a graveled highway. The total yardage in the dam is about two million cubic yards. All but about 150,000 cubic yards were placed with a 24-inch

Driving Steel Sheet Piling in Core Trench. From six to eight feet of the piling was allowed to stick up from the bottom of the trench to be encased later within the puddled core.

Right — The Electric Dragline Digging the Cut-off Trench for the Puddled Core of the Dam.

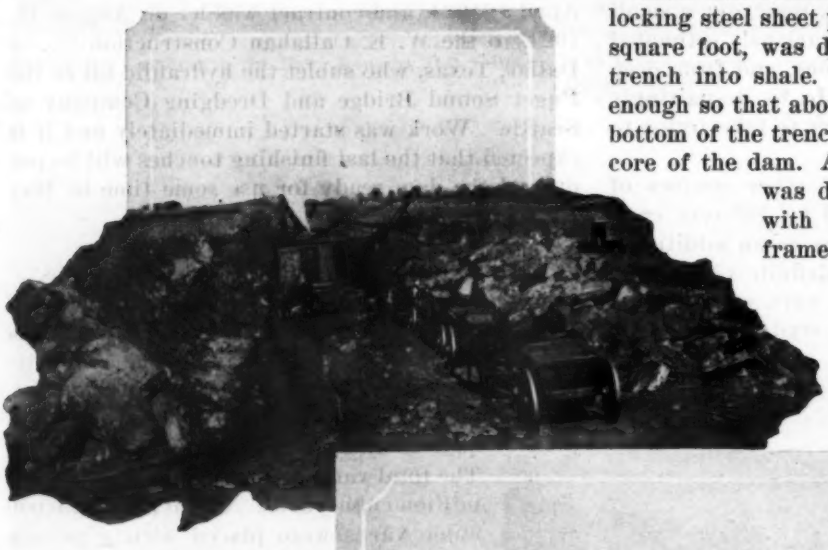
suction dredge, pumping the material from borrow pits in the valley above the dam. This makes a lake of about 11,000 acres area, storing at spillway level, 63 billion gallons. The drainage area above the dam is 1,100 square miles.

From the reservoir thus formed the water is let down the river channel to the old pumping and filtration plant. Plans are now under way to double the capacity of this pumping and filtration plant, as it is planned to abandon the White Rock reservoir for water supply, and make a pleasure resort out of it.

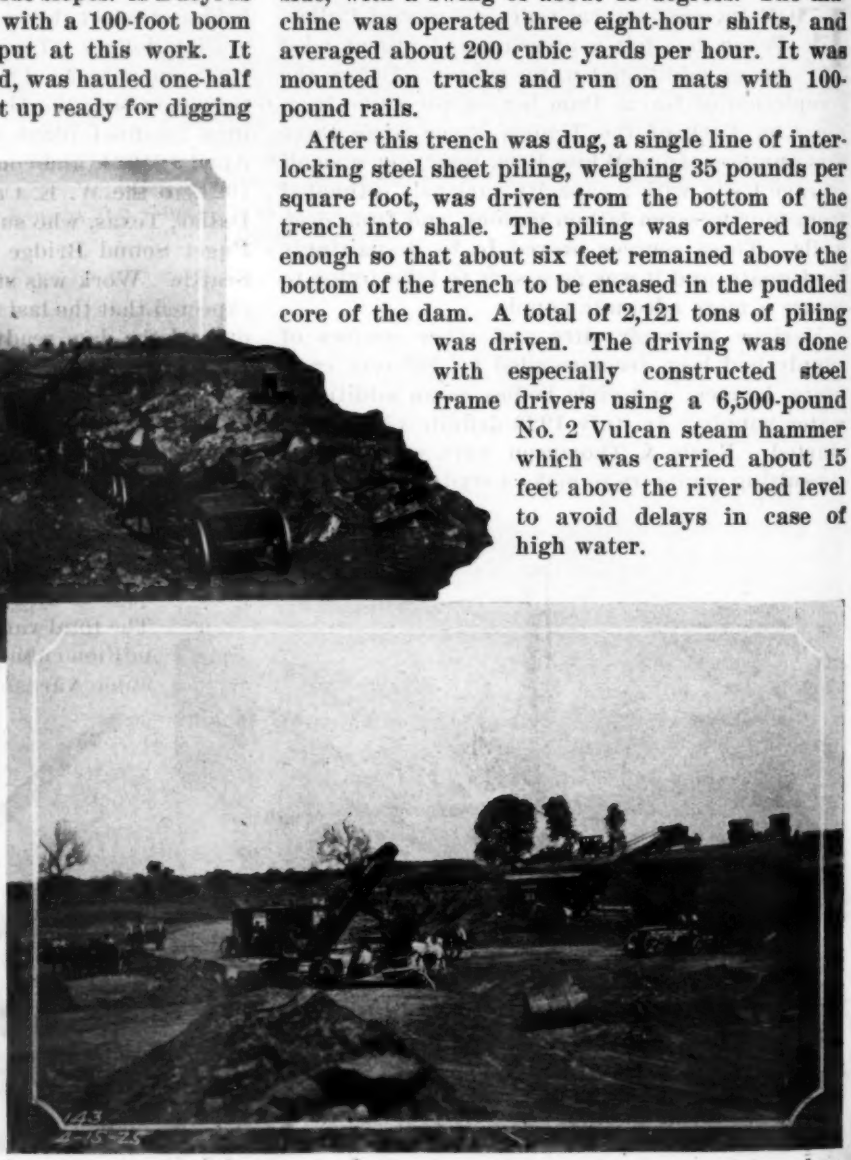
Digging Core Trench with Electric Dragline

A core trench was dug along the center line of the dam. This trench was dug to river bed level, or from 25 to 30 feet depth. On the bottom it was about 12 feet wide with 1:1 side slopes. A Bucyrus Class-24 dragline equipped with a 100-foot boom and a 5-yard bucket was put at this work. It arrived on the job dismantled, was hauled one-half mile across the river, and set up ready for digging in ten working days from the time it arrived at the dam site. It started digging November 4, 1924, and had dug 118,000 cubic yards by December 4, 1924. The total work laid out for it was 275,000 cubic yards in the cut-off trench, and about 100,000 cubic yards in other ditches and levees. This was an electric machine, and the power was supplied by the Texas Power and Light Co. to the substation on the job at 60,000 volts and reduced to 2,300 volts. A bank of transformers mounted on a wagon reduced the 2,300 volts to 440 volts. From the transformers it was carried to the dragline through three 400-foot lengths of Tyrex Royal Cord cable. The material encountered was black gumbo, brown clay, and a sandy clay. About 65 per cent of this was of the black gumbo and brown clay. This was overcast about 50 or 60 feet to the side, with a swing of about 45 degrees. The machine was operated three eight-hour shifts, and averaged about 200 cubic yards per hour. It was mounted on trucks and run on mats with 100-pound rails.

After this trench was dug, a single line of interlocking steel sheet piling, weighing 35 pounds per square foot, was driven from the bottom of the trench into shale. The piling was ordered long enough so that about six feet remained above the bottom of the trench to be encased in the puddled core of the dam. A total of 2,121 tons of piling was driven. The driving was done with especially constructed steel frame drivers using a 6,500-pound No. 2 Vulcan steam hammer which was carried about 15 feet above the river bed level to avoid delays in case of high water.



This shows how the shovels had to push the boulders to one side before they could be shot during excavation for the spillway.



Right — The Two Gasoline Shovels Stripping Off the Overburden at the Gravel Pits.

Dredge Hull Built on the Job

The material for the core of the dam and the embankment was taken from a borrow pit above the dam. It contained stiff alluvial clay with occasional sand strata and pockets of gravel. The Puget Sound Bridge and Dredging Company contracted for this part of the work. They built a suction dredge hull on the dam site, mostly out of Oregon fir, and assembled the machinery aboard it right on the job. This was a standard size 24-inch dredge, but in the beginning it was thought best to operate it as a 20-inch dredge with 20-inch pipe and smaller impellers in the pump. This did not prove as satisfactory as had been expected, so a change was made back to 24-inch pipe and regular 24-inch equipment.

Above — Loading Gravel into Ford Trucks Through a Trap. The gravel is then taken to the central mixing plant shown in the center.

Right — Construction Work on the Twin Outlet Conduits. This gives an idea of the amount of excavation necessary.

Placing the Hydraulic Fill

Power was supplied by a 1,600 horse power, 2,300-volt, alternating current motor. The excavated material was carried on to the dam through 6,000 feet of steel-welded pipe of number 10-gauge high-carbon steel. The elevation for the water in the core pool was governed by a controlled outlet. The spillway thus provided allowed the water in the pool to move but very slowly, which gave ample time for the fine sand and clay carried in suspension to settle. The clay frequently discharged from the pipe on to the dam in balls of from ⅛ to 10 inches in diameter. They subsequently disintegrated and fused into the mass of the dam. The relative elevation of the end of the discharge pipe and the core pool fixed the line between the coarse material in the outer sections and the fine puddled material in the core. The pipe discharged the alluvial material along the outer edges. The gravel and coarser sediment remained there because there was not enough velocity to carry it further, and the fine silt went to the center in the core pool, which was always maintained. The core was built up to within about 12 feet below the top of the dam and about 12 feet wide at the top. Two P. & H. gasoline draglines were used to bring up the levees and maintain the embankments during the course of the construction of the core pool.

Twin Outlet Conduits

Just south of the river channel and under the base of the dam, twin concrete outlet conduits were built. These are each 485 feet long, 19 feet high and 14 feet 6 inches wide in the clear. This provided passage for flood water during the course of construction of the dam, and served as permanent outlets from the reservoir to the settling basins and filtration plant 25 miles down the river channel.

The material encountered during the course of excavation for these conduits was a firm sandy shale which required heavy shooting before removal. The shale stood well on steep slopes under weathering, so the concrete was placed directly against it without forms. Two Erie oil-burning steam shovels with 1½-cubic-yard dippers did the excavation work here. They were served by 3-up dump wagons, which placed the material in the toes of the dam across the river, from 300 to 1,000 feet away. Excavation to the extent of 54,000 cubic yards was required for the construction of the conduits.

The arch forms for the conduits were built in 15-foot sections, with construction joints 30 feet apart. These forms were put in place after the sides had set, were lowered on to greased skids bolted to the top of the side walls for moving ahead. The conduits contained 4,800 cubic yards of concrete. The discharge capacity is about 12,000 second-feet of water, which approximates the flow

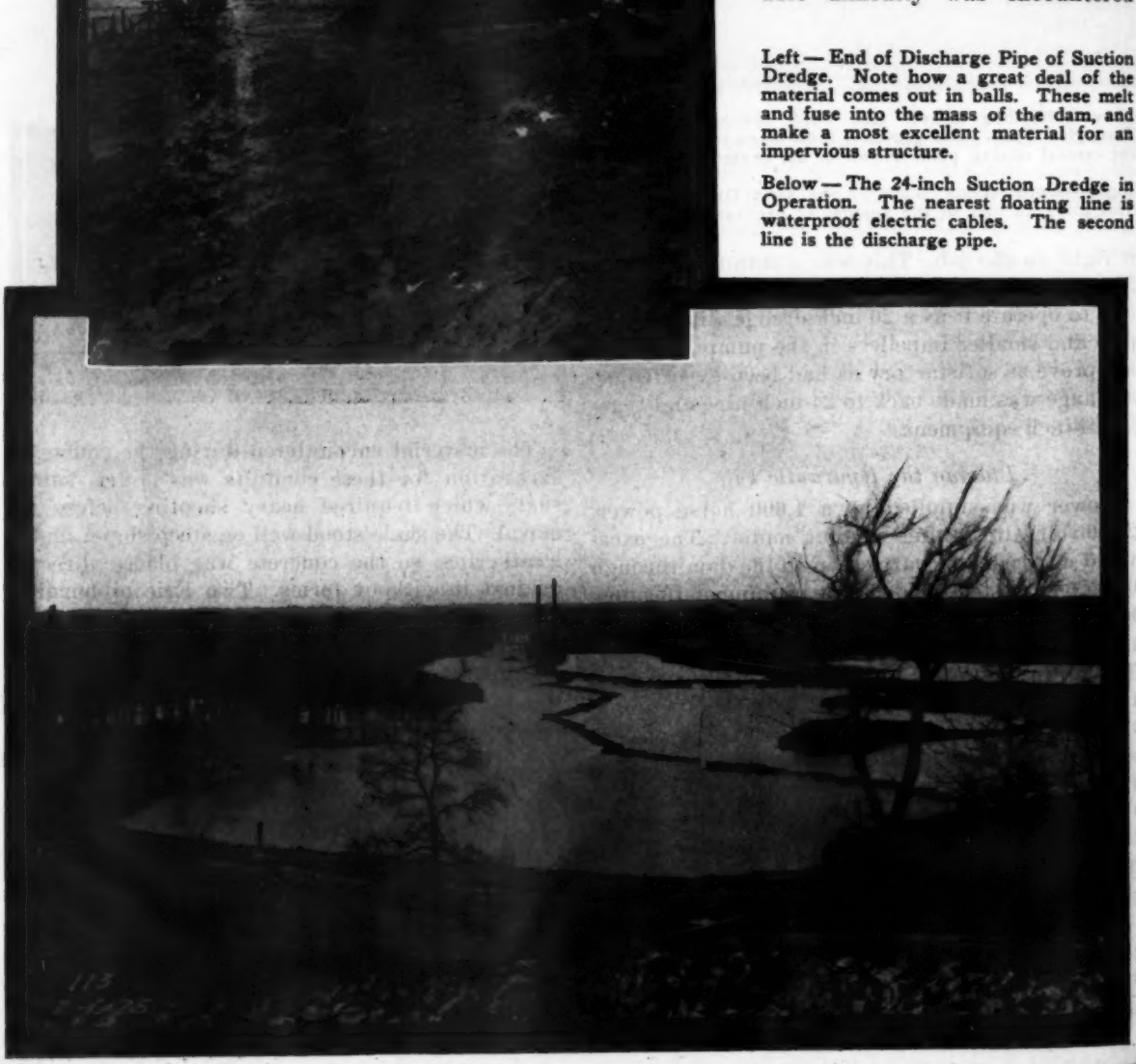
of the stream under ordinary flood conditions. Timber stop logs were placed across the upper ends to store water for operation of the dredge, but after completion of the dam they will be replaced with double concrete plugs. Each of these will contain two 48-inch pipes controlled by 48-inch gate valves in the chamber between the two concrete plugs. In one conduit an 18-inch pipe will be placed to take care of the normal flow of water when it is not necessary to have the larger valves open. A concrete tower extends up through the dam from the gate chamber, and a house on top of this tower contains all the machinery for the operation of the valves.

The Spillway and Excavation Involved

South of the river channel on high ground, a 560-foot concrete spillway was built, resting directly on the hard blue shale, which in general underlies the whole dam. This contains about 24,000 cubic yards of concrete, and required 230,000 cubic yards of excavation. The two Erie shovels were used on this excavation work. Considerable difficulty was encountered

Left — End of Discharge Pipe of Suction Dredge. Note how a great deal of the material comes out in balls. These melt and fuse into the mass of the dam, and make a most excellent material for an impervious structure.

Below — The 24-inch Suction Dredge in Operation. The nearest floating line is waterproof electric cables. The second line is the discharge pipe.



here, due to the presence of a heavy boulder formation found just under the surface. These boulders ranged in size from about one-half yard to five or six yards. They were badly mixed up with earth, and could not be handled at first except by lifting with earth shots. The shovels then got the earth out and rooted the boulders to one side in a windrow, where they were block-holed and broken up with dynamite.

The spillway weir is from 20 to 25 feet high, and the crest of the spillway is 15 feet below the top of the earth dam. The excavation was carried down on a slope of 1¼ :1 from the downstream toe of the weir, so that the top of the concrete apron at the foot of the slope is 3 feet below the present river bed and 68 feet below the crest of the spillway. The slope was paved with four feet of concrete. At the downstream edge is a concrete cut-off wall extending 10 feet into the shale. Extending longitudinally through the spillway weir is a seven-foot tunnel used for inspection purposes and to collect seepage from underneath. There are two rows of tile drains under the upstream third of the weir base, and risers from these extend up through the floor of this passage, and suitable discharge openings have been provided from this passage to the downstream face of the weir at each end of the spillway. Concrete was poured into the spillway from a tower which was mounted on broad gauge tracks running parallel with the structure.

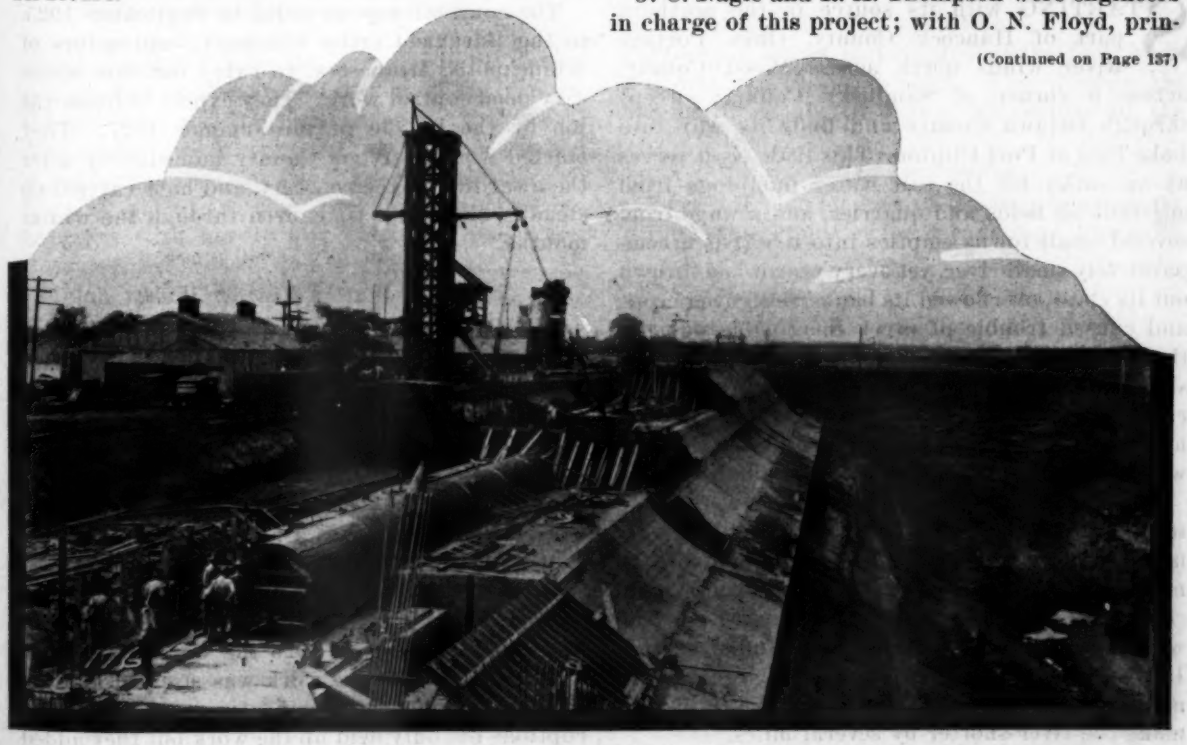
All concrete for the dam construction was hauled from a central concrete mixing plant. The pit run gravel was elevated to the top of the plant and screened and stored in bins, so that the sand and gravel would flow by gravity into the measuring boxes and on into the one-yard cube mixer. The concrete was hauled from the plant in 1½-yard side-tilting, 24-inch-gauge cars.

Two Shovels Work the Gravel Pit

At the gravel pits two gasoline shovels were used to strip off the earth. One was a Bucyrus 30-B and the other was a Northwest shovel. These were operated one ten-hour shift per day. The average output per day was 600 cubic yards for the Bucyrus and 450 cubic yards for the Northwest. The two shovels burned about 50 and 54 gallons of gasoline respectively per day. These were served with 1½-yard wagons, about ten to each shovel. The material was dumped just any place out of the way, the average haul being 500 feet. After the overburden was removed, the gravel was loaded through traps into one-ton Ford trucks equipped with steel dump bodies. The average haul was about 1½ miles. About 30,000 cubic yards of gravel was used for concrete, 30,000 cubic yards for a gravel blanket under the rock rip rap which paves the upstream slope of the dam, and about 12,000 cubic yards for the graveled roadway on top of the dam. This roadway is carried over the spillway on a 4-span steel bridge.

J. C. Nagle and R. A. Thompson were engineers in charge of this project; with O. N. Floyd, prin-

(Continued on Page 137)



The 560-foot Spillway under Construction. Note the longitudinal seepage and inspection passageway.

Upper — Many difficulties were encountered in the course of the work and this well illustrates one of the things the contractor had to contend with.

Right — Another view in the rock section.

Flood Control Work in Ohio

Description of the Work of the Barnard-Curtiss Company, Involving 1,000,000 Cubic Yards of Excavation. Improvements on Portage River in Northern Ohio

STARTING with its source in the northern part of Hancock County, Ohio, Portage River winds north across Wood County, across a corner of Sandusky County, sweeps through Ottawa County and finds its way into Lake Erie at Port Clinton. This little river serves as an outlet for the salt water pumpings from adjacent oil fields and quarries, and sewage from several small towns empties into it. It is a comparatively small river, yet every year it has thrown out its chest, overflowed its banks, destroyed crops and caused trouble of every imaginable description. One of the accompanying illustrations, showing a dragline excavator caught in a sudden rise of water, tells a very conclusive story of just how the river acted, and the conditions as they were before the present work was started.

Something had to be done, so plans were made to provide for a larger carrying capacity and a much quicker run-off. As a result, about fifty miles of the river in Wood County, where flood conditions were the worst, is being improved. The work involves both straightening and dredging. It is being deepened to a considerable extent in many places. The straightening work will also make the river shorter by several miles.

The contract was awarded in September 1925, to the Barnard-Curtiss Company, contractors of Minneapolis, Minnesota, to carry out this necessary flood control work. They expect to finish the job by the middle of the summer 1927. They started work in Wood County immediately after the awarding of the contract, and have carried on steadily since that time, even through the winter months.

Flood Waters Hamper Work

This has turned out to be an exceptionally tough job. The total yardage of excavation necessary amounts to 1,000,000 cubic yards. About 50,000 cubic yards of this is rock and the rest is heavy earth excavation involving the cutting of new channels. Another factor making the job especially difficult has been the weather conditions. The season of 1926 was a record breaker for continuous rainfall and flood water. This hampered the shovel work to a great extent. Normally, only one or two feet of water is carried in the river. But during the summer of 1926 the water rose again and again, so that the work was stopped and the equipment submerged many times. These interruptions not only held up the work but they added

many difficulties to the planning and carrying out of the work.

Shovel Encounters Tough Work

For digging equipment, the Barnard-Curtiss Company installed their Bucyrus 50-B Diesel shovel, equipped with an extra high-lift boom, long dipper sticks and a rock-handling dipper. This machine was put right in on the rock work. Most of the time it worked along right in the bed of the stream with caterpillars half submerged. In many places the river ran along in small depressions with hardly any banks. These were, of course, overflowed during high water. The duty of the machine then was to work along these sections, deepen the channel and dump the spoil on both sides, thus building up the banks. In other places wide bottom widths and high banks are encountered. In these sections, the work is channel-straightening and clean-out work. Since practically all the material must be overcast, the sixty-foot bottom widths and high banks present a difficult disposal problem. The machine, equipped as it is with an extra high-lift boom, is able, however, to dig and dispose of the material with a minimum of rehandling. The only places where any amount of rehandling is necessary is where the new channel does not follow the old, but this aggregates a negligible amount.

One of the earth sections. The channel of the river was changed in several places in order to shorten it.

The shovel is working two ten-hour shifts per day. The fuel consumption runs from 25 to 30 gallons per shift. The fuel is furnished in tank wagon lots at a central point, and from there it is distributed in barrels along the site of work.

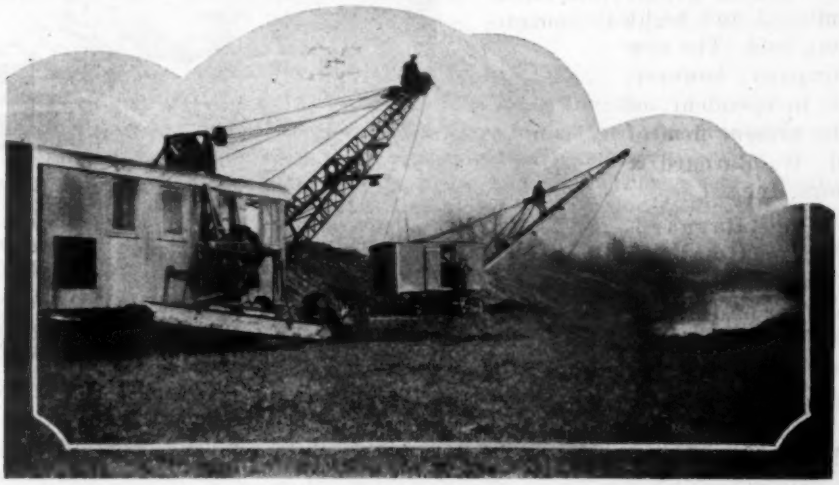
Practically all the rock sections had to be drilled and blasted. The size of the rock shown on the dipper gives some idea of what the shovel had to contend with.

C. G. Hunley and Ben Habedank alternate night and day shifts as operators.

After the shovel had completed the rock work it moved into the earth work. This involves the cutting of canals to change the course of the river.

Blasting Operations

A considerable amount of blasting is necessary in the rock sections of the excavation. For drill-



Draglines used by one of the sub-contractors for handling part of the earth work.

ing purposes, six Ingersoll-Rand Jackhamers and two Ingersoll-Rand 9 x 8 Type 20 portable air compressors are used. A Leyner drill steel sharpener and a coke forge are also on the job. The powder used is Atlas 40 per cent. The holes are spaced from 4 to 6 feet apart, and fifty of them shot off in series. The rock cuts fairly easily, but much difficulty is encountered in keeping bottom on account of seams and the large amount of water and sediment carried by the river this year.

Two Subcontractors on the Job

To help in the earth work and take care of some of the details, the Barnard-Curtiss Company let two subcontracts. The W. H. Small & Son Company of Aitkin, Minnesota, has a 1½-yard Bay City walking dredge and a three-quarter-yard floating dredge, both powered by gas engines. The floater is used on the upper portions of the work on a small cross section, and the walking dredge is digging a ditch 10 to 30 feet wide at the bottom and up to 12 feet in depth. M. J. Zabawa, of Wisconsin Rapids, Wisconsin, is using a one and one-half yard walking-type dredge, gas powered and a three-quarter-yard Bay City dragline. The dragline is used on the smaller portions of the work, and also for cleaning out under bridges and general clean-up work.

Barnard-Curtiss Organization — Past and Present

The Barnard-Curtiss Company is a comparatively young organization, having been formed in 1921. It is composed of the old firms of M. W. Barnard & Son and the firm of Rodgers & Curtiss Company, both of Minneapolis. Both these firms have had long experience in the railroad and highway contracting field. The new company, however, is independent of the present firm of M. W. Barnard & Sons, Inc.

The Barnard-Curtiss Company has completed a number of drainage and irrigation projects, aggregating over six million cubic yards of excavation, in the States of Minnesota, Montana, Colorado, Iowa and Ohio. Besides the Portage River project, they are also engaged in the stripping of a quarry at Union Bridge, Maryland, for a cement plant, in conjunction with R. A. McMenemy of St. Paul, Minnesota.

Mr. E. A. Rodgers and J. A. Barnard alternate in directing the operations in the field for the Barnard-Curtiss Company. Mr. Norman W. Locke is county engineer on the job, and Mr. I. L. Stinebaugh is assistant in charge of the work.

We are indebted to Mr. Barnard for the information contained in this article.

Upper — Deepening the channel and casting the material on both sides to provide for a greater carrying capacity. Note the heavy character of material handled here.

Left — Looking down one of the earth sections. In channel change work the ditches were made about 12 feet deep.

Sentry Duty

The owner of a big plant, addressing a new employee:

"Did my foreman tell you what you will have to do?"

"Yes, sir, he told me to wake him up when I see you coming." — *Forbes Magazine.*

A country boy who had never seen a circus before was walking around the tent, when one of the clowns lifted up the flap and stepped outside for a little air. Running to the ticket taker, the boy cried excitedly:

"Hey, mister, yer clown's loose!"

— *America's Humor.*

The Garza Dam Project

(Continued from Page 133)

cipal assistant engineer; J. L. Lochridge, designing engineer; and T. C. Shuler, resident engineer.

We are indebted to O. N. Floyd of Floyd & Lochridge, consulting engineers, for the information used in the preparation of this article.

Stone Quarry Awarded Certificates for Exceptional Safety Record

Certificates commemorating exceptional safety records have been awarded by the Holmes Safety Award Committee of the Joseph A. Holmes Safety Association to Mine No. 6 of the United States Coal and Coke Company at Gary, West Virginia, to the Benjamin, Francis and Berry coal mines, of the Ford Collieries Company, at Curtisville, Pennsylvania, and to the Federal Mining and Smelting Company at Baxter Springs, Kansas. The first two companies named had records of no fatal accidents over a period of years; the third had a record of having operated for almost eighteen months without a fatal accident, and without any "lost-time" accident underground.

In the quarrying field, a certificate was awarded to the Speed open limestone-rock quarry operated by the Louisville Cement Company at Speed, Indiana. No fatal accidents and no "lost-time" accidents occurred at this quarry during a period of more than two years from June 1, 1924, to December 31, 1926. A total of 545,497 man-hours, or 60,611 man-days, was worked at this quarry during this period.

The Joseph A. Holmes Safety Association is an organization named in honor of the first Director of the United States Bureau of Mines, now deceased. Its principal aim is to further the cause of safety among the million miners of the United States, Dr. Joseph A. Holmes having been conspicuous in the inauguration of the organized mine-safety campaign in this country. The Association includes in its membership the Bureau of Mines, a considerable number of scientific and engineering societies, and various mine operators' and miners' organizations. The Holmes Safety Award Committee meets annually for the purpose of awarding certificates in recognition of exceptional safety records made by mines and quarries.

The awards just made, according to Dr. R. R. Sayers, chief of the Health and Safety Branch of the Bureau of Mines, and acting secretary of the Joseph A. Holmes Safety Association, are not necessarily meant to be in recognition of the best safety records made by mines and quarries, but are intended rather to commemorate exceptionally meritorious safety records which have come to the committee's attention. The committee, Doctor Sayers stated, would be glad to have brought to its attention noteworthy safety records at other mines or quarries.

Spanish Highway to Be Built by Private Capital

Authority to construct Madrid-Cuenca-Valencia Highway, Spain, at his own expense was granted to Don Luis Escriba de Romani y Fernandez de Cordoba, Marques de Argelita, Plaza de Santa Barbara 1, Madrid, by a Royal Decree of January 7. The rather extraordinary privilege of constructing a public highway at private expense is extended by the decree to authorize the concessionaire to "exploit the highway in accordance with a tariff subsequently to be approved, and for a period to be set forth in a plan to be drawn up and submitted within a period of six months." This is taken to mean that the highway will be operated as a toll road.

Sales of Lime in 1926

The lime sold by producers in the United States in 1926 amounted to 4,580,000 short tons, valued at $40,800,000, according to estimates furnished by lime manufacturers to the Bureau of Mines, Department of Commerce. This is approximately the same quantity, but a decrease of 4 per cent in value as compared with sales in 1924. The sales of hydrated lime, which are included in these figures, amounted to 1,570,000 tons, valued at $14,576,000, a small increase in quantity and a decrease of 5 per cent in value. The average unit value of all lime showed a decrease from $9.30 a ton in 1925 to $8.91 in 1926, and that of hydrated lime a decrease from $9.79 a ton in 1925 to $9.28 in 1926.

Ohio, the leading state, showed a decrease of 2 per cent in total sales and 5 per cent in sales of hydrated lime. Pennsylvania, which ranked second, showed an increase of 4 per cent in total sales. Of the twenty-two states in which more than 25,000 tons were sold twelve showed increased sales, but in no state was the increase or decrease large.

To Repel Invaders

The following sign is displayed above the ice cream counter of a prominent drug store:

"Take a brick home; it's fine when company comes." — *Union Pacific Magazine.*

Another One

"I'm a father!" cried young Jones as he burst into the office.

"So's your old man," replied the boss. "Get to work." — *Jack-o'-Lantern.*

First Burglar — "Come on! Let's figure up and see how much we made on this haul."

"Shucks! I'm tired. Let's wait and look in the morning papers."

The
EXCAVATING ENGINEER

A Monthly Publication Devoted to Excavating and Allied Subjects

REGULAR SUBSCRIPTION: $1.00 a year for 12 numbers.
SPECIAL SUBSCRIPTION: Upon application on card inserted in this number, subscriber's name will be placed on Rotating List, whereby he will receive The Excavating Engineer frequently (not regularly) free of charge.

THE EXCAVATING ENGINEER PUBLISHING CO.
F. O. WYSE, Manager-Editor
South Milwaukee, Wisconsin
Printed in the U. S. A.

The Business Situation

Sometimes it seems difficult to say whether it is the condition of business which is reflected in the thoughts of men, or whether it is the thoughts of men which are reflected in the condition of business. At any rate, general business conditions are improving gradually, but certainly, from the doubt which men's minds have cast about the situation for the past several months.

The Iron Trade Review in a monthly letter by John W. Hill, Financial Editor, puts it in this manner: "Nineteen twenty-seven is emerging slowly but sure-footedly from the veil of traditional new year uncertainty. What seemed highly unfavorable factors have grown less menacing, the pendulum of industry is swinging gradually forward and sentiment is less anemic. The level of activities is definitely below those of one year ago. Yet the trend is upward and another prosperous half year now seems indicated."

Some phases of business are a little less active than they were during the unusual activity of a year ago.

The picture of the conditions of the farmer is painted in hues more sombre than are really justified. While without a doubt the fall in agricultural prices has materially impaired the purchasing power of this large section of our population, it seems only logical that the farming industry will find its way out of a situation which is by no means any worse than many that have been experienced by the manufacturing industries. Manufacturing industries, it should be remembered, face competition even in their domestic markets, which is just as keen as the competition faced by the farmer; in the manufacturing industries overproduction is punished by the laws of supply and demand with the same severity that is met with in the field of agriculture.

New building projects are a little smaller in volume than a year ago. Mail order sales are a little smaller than a year ago. Factory payrolls are a little under those of twelve months back.

On the other hand, however, there is an ample supply of money at reasonable rates of interest. Small stocks of merchandise are being held. The Federal Reserve outstanding credit is lower than it has been over two years. Electric power consumption, which can be taken as a rather definite indication of the activity of industry, is higher than in November or December although somewhat under January of last year. Checks, cashed by banks throughout the country show that the actual volume of business is matching up very well with the records of previous years, while the debits by the Federal Reserve Bank for the first eight weeks of this year show an increase of four and one-half per cent over the same figure for the first eight weeks of last year. This is in spite of the fact that wholesale prices are some six per cent lower than a year ago.

With the very excellent weather we have been experiencing in the past few weeks, the automobile industry, which has most certainly been proceeding very carefully, should receive the impetus necessary to experience a good spring season.

Although the lumber business has been slow in getting under way, other building materials have not experienced the same marking of time, for the first month of this year.

Building itself is still under the level of a year ago but it is standing at a level which would have been considered high for any other time than during the last year. The National City Company in a letter on business conditions says, "There is said to be a slight increase in the shortage existing in single family dwellings, apartments and business buildings, a barely perceptible change from June of 1926 in the situation as to residential rents, and an increased stabilization of rents for business and office space both for central locations and for outlying districts. Money for real estate investment is generally easy, with interest rates continuing steady."

Money conditions continued easy in February. Call loans have ruled chiefly at 4 per cent, with occasional dips to 3¾ per cent, compared with an average of around 5 per cent during the same month last year. Time money is quoted 4⅜ to 4½ per cent, against 4¾-5 per cent last year, prime open market commercial paper at 4 per cent against 4½ per cent one year ago, and offering rates for bank acceptances 3⅝ per cent against the same last year. Not until late in the month did call rates show any tendency to advance, the rate then touching 4½ and 5 per cent in response to preparations for the usual March 1 settlements.

Spring is entered with available supplies of

credit substantially greater than at this time a year ago. Recent gold imports, together with lessened demand upon the member bank, has reduced the volume of reserve bank credit outstanding to the lowest point since 1925.

2,100 Tourists Visit Panama During One Week

During the week from February 4th to February 11th inclusive, six vessels carrying tourists on special cruises visited the Panama Canal. Thus the tourists for that week who visited the canal zone amounted to approximately 2,100.

From THE MAIL BAG

Notes Received from Shovel Operators in the Field.

"Sirs:

Herewith my subscription to The Excavating Engineer, which I am always glad to receive.

I am at present overhauling equipment for Taggart Construction Company of Cowley, Wyoming, which includes a Bucyrus 30-B gas dragline.

Yours truly,

HARRY B. LITTIG."

Our thanks to Mr. Littig. — *Ed.*

"Sirs:

I sent you one dollar in December for a year's subscription to The Excavating Engineer, beginning with January 1927. I have not received a copy. Please let me know why I am not receiving same.

Yours respectfully,

BURTON GAYLOR,

Fort Lauderdale, Florida."

Subscriber Gaylor neglected to give us his post office box number, and the insufficient address caused the non-delivery of his magazine. — *Ed.*

"Gentlemen:

Desire a copy of November number of your publication with story of coal operation at Colstrip, Montana. Any charge connected therewith will be gladly remitted.

J. J. SPRINGER,

Continental Coal Company."

A copy of the November number has been sent with our compliments. — *Ed.*

"Sirs:

Referring to the attached card, I wish to advise that my home address is Prairie du Chien, Wisconsin, but as I have been appointed Supervisor of Locomotive Cranes, Lines West, I will make my headquarters at Seattle, Washington. Therefore, in the future, when you have any extra copies of The Excavating Engineer you can send them to the Seattle address.

Thanking you, I remain,

Yours,

EDW. P. SIMA,

C., M. & St. P. Ry."

Note: We will be glad to send The Excavating Engineer to Mr. Sima from time to time. We send him our best wishes for success in his new position. — *Ed.*

A New Bucyrus 1-Yard Diesel Shovel

The New Bucyrus D-2 one-yard Diesel shovel, convertible to dragline, clamshell and crane, has just appeared on the market.

The new D-2 is the product of 47 years of Bucyrus experience in building excavating machinery. It will be remembered that Bucyrus was the first company to manufacture the Diesel-driven excavator.

Lower fuel, yardage and upkeep costs, together with increased power, were guiding principles in the construction of the D-2. The combination of a high-speed digging cycle with the economy of Diesel power gives it features of swift, economical operation.

The power plant of the D-2 is a four-cycle, full-Diesel engine. The fuel is fed into it mechanically, providing high economy of fuel consumption and avoiding the use of air compressor. In addition, the engine can be started from stone-cold to full load in 20 seconds, no priming and preheating being necessary. The engine is mounted on a raised base, which is bolted securely to the cast revolving frame — a mounting that provides a direct connection between the main machinery and engine, and which insures perfect alignment at all times.

The Bucyrus center pintle construction relieves the vertical propelling shaft of all digging strains, and keeps the revolving frame centered on the base frame, and protects the vertical propelling shaft from wear and breakage.

A patented rope crowd is used on the machine, which makes it possible for crowding and hoisting operations to take place individually, as well as simultaneously. The new straight boom of the D-2 Diesel has all the advantages of the Bucyrus bent boom, with the added advantage that the machine operates better with the boom at low angles. Since this boom is lighter, the machine has a quicker swing and better stability.

The two-part hoist and the big drum used in the main machinery and on the boom insure proper track-

ing of the ropes and lengthen their life. Outside dipper handles insure that the full force of the engine is transmitted squarely behind the dipper. The lightweight box girder boom with outside dipper handles require less counterweight at the rear of the D-2

shovel — there is less flywheel effect to act against the swinging machinery, making the D-2's swing fast at every stage.

An outstanding feature of the caterpillar mounting of the D-2 is its simplicity and fewness of parts, with more than sufficient tractive power to enable the excavator to climb up inclines as steep as 30 per cent.

Joints Sealed Against Oil Leaks by New Paint

A paint which is said to be the only material that effectively seals joints against oil leaks has been developed by the *General Electric Company* and is sold by the Merchandise Department at Bridgeport, Connecticut. The product, known as G-E No. 880 Red Protective Paint, also prevents water and gas leaks. It can be used for many purposes which require red lead or white lead, and is less expensive than either.

The paint, which is dark red in color, requires no priming, and can be applied by brushing or dipping. Denatured alcohol is used as a thinner. It dries rapidly, and produces a hard, smooth, glossy film, which is easily cleaned and which prevents excessive collection of dirt and conducting material, thereby decreasing surface leakage and subsequent carbonization of surface when used with electrical apparatus.

One of the first fields in which the paint has been applied is in the manufacture of fuel oil burners, in which one company is now using the material to seal all joints. Other fields in which there will be applications for the paint include plumbing, chemical plants, repair and service shops, packing houses, ship yards, central stations, electric railways, mines, and the manufacture of oil tanks, oil-burning locomotives and similar equipment.

New, Small-Sized, Gas-Engine-Driven Electric Welder

The General Electric Company of Schenectady, New York, announces an addition to its line of welding equipment, a small gas-engine-driven welding unit. This set incorporates the G. E. WD-11 welding generator with a continuous rating of 150 amperes, and a one-hour rating of 200 amperes, the current range running from 50 to 250 amperes.

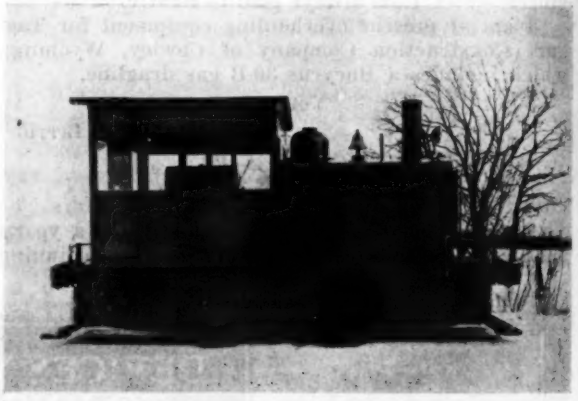
The generator is driven by a Continental P-20 Power Unit rated 18.22 horsepower S. A. E., and capable of developing 23.5 horse power at 1400 r.p.m. The generator is equipped with a control panel, rheostat and self-adjusting stabilizing reactor. The engine accessories include a strongly constructed radiator, pressure feed lubricating system with oil pressure gauge and indicator, vertical tube gravity feed carburetor, air cleaner, centrifugal governor, starting crank, 10-gallon gasoline tank, tool box, and sheet metal hood with sheet metal side panels which can be locked in place.

The set is mounted complete on a structural steel base, so designed as to facilitate easy moving from place to place.

A 30-Ton "Whitcomb"

The Dupont Rayon Company recently purchased a 30-ton gasoline locomotive from the *Geo. D. Whitcomb Company,* one of the largest gasoline haulage tools that has ever been built, with the possible exception of a type for experimental purposes.

This Giant "Whitcomb" is powered with a 6-cylinder, 6½ x 7, Beaver engine, capable of developing 160 horse power at 1,000 revolutions per minute. It has a draw bar pull of 17,500 pounds on low gear without sand.



The frame is of solid type construction, axles of forged steel, and wheels with chilled tread, or of any type required by the purchaser. Transmission allows for all speeds, either forward or reverse, and sand is furnished at all four wheels.

The need for a powerful, heavy-duty gasoline locomotive is well met in this unit that embodies all of the established "Whitcomb" characteristics — more horse power per ton of weight, maximum draw bar pull, low center of gravity, high track clearance, short overhang, and quick acceleration.

A New 3-in-1 Paint Spray

The Alexander Milburn Company, 1416 West Baltimore Street, Baltimore, Maryland, has just announced a "3-in-1" spray gun which is adaptable to very fine work, such as painting and lacquering automobiles, furniture, etc., or on coarse operations, such as painting of machinery, freight cars, etc.

The reason for its name lies in the fact that it has a triple purpose, for use either as a siphon-feed, a pressure-feed or a gravity-feed spray. It is quickly adaptable to use by any of the three methods, whichever may be convenient for the work in hand.

SHOTS FROM THE FIRING LINE

P. F. Burke writes that he is running a Bucyrus 70-C for R. H. Wright and Sons, with L. A. Thomas craning and Sam Steele making the smoke.

A pretty setting for a steam shovel — the first shovel full of dirt dug on the excavation for a new school at Cleary

Square, Hyde Park, Massachusetts. J. C. Coleman's Bucyrus 31-B extra high-lift shovel is taking its first bite.

Central States Notes

BY H. C. EMERY

The following contractors were awarded contracts on the Green Island Drainage project at Maquoketa, Iowa, recently: Mulgrew & Sons of Dubuque, Iowa, Sections 1, 9, 10, 11, 12, 13 and 14, entailing 228,000 cubic yards of ditch work; Strom Construction Co. of Gary, Missouri, Sections 2, 3, 4, 5 and 6, entailing 436,000 yards; and Barnard-Curtiss Co., Minneapolis, Minnesota, Sections 7 and 8, representing 347,000 yards of levee. The total bid was approximately $159,000.

Briggs & Drew of Omaha were successful bidders on a drainage job let at Atlantic, Iowa, on February 24th. The job approximates 440,000 cubic yards of excavation, and the contractors plan to use their old 3T Monighan for the work.

F. L. Busche of Omaha was recently awarded 40,000 yards of road work in Sarpy County, Nebraska, and plans to install his Byers dragline as soon as conditions will permit. He also has 7,000 yards at 22nd and Harvey Street on which he is using his Bucyrus 20-B gas. Culley is at the levers, and some exceptionally large yardage is being moved.

Work on the spillway at Bellows Falls, Vermont, where the New England Power Company is building a dam for power development across the Connecticut River. The loca-

tion of the spillway can be seen in this illustration — just back of the bridge on the left side of the picture.

Chicago and Vicinity

BY H. C. HELT

T. J. Forschner Contracting Co., Chicago, Ill., was awarded the West Side Sewage Disposal plant some months ago. Their Bucyrus Class-14 machine is being operated by B. A. Smith, an old Bucyrus operator, who was formerly with Nash Bros. of this city as an operator on their Class-14 steam dragline. The fireman on this machine, working under Mr. Smith, is John Moran. On the Class-80 dragline, Carl Winwiser is the operator and the fireman is W. Frolke. This company has about 150,000 cubic yards of material to handle with these two machines, and it will be well towards the end of next fall before the job is near completion.

Great Lakes Dredge & Dock Co., Chicago, Ill., recently was awarded a large contract for the American Sheet & Tin Plate Co. at their Gary Tin Mills, Gary, Indiana. At the present time they are using a Bucyrus 41-B steam dragline on the excavation work for concrete foundation, and the operator on this machine is J. Ballan, and the fireman, F. Ballan, on the day shift. C. Ward is the operator and R. Ward is the fireman on the night shift. This company has over 100,000 yards of material to move on this job, and it is estimated that it will take several months to complete the work. The above company also has a Bucyrus 31-B steam machine, which has been working on pile-driver work at the Federal Furnace Co. at South Chicago. The operator on this machine is Eddie Schraeder and the fireman is A. Gallagher. On the pile-driving work his machine has been making records averaging 45 40-foot piles a day, and due to

SHOTS FROM THE FIRING LINE — Continued

the skillful handling of Mr. Schraeder made an enviable record at the Federal Furnace Co. This machine will no doubt be sent over to the Gary Tin Mills shortly to assist in the work there.

BY D. C. ANDERSON

The Common Brick Manufacturers Association held their Convention at the Hotel Sherman the week of February 21st. The meeting was very instructive and interesting, especially the meeting up the express elevator. Illinois Brick, Bohnsack Brick and all the other Chicago Brick Company's were well represented, and there was a delegation from nearly every state in the Union.

The Meir Bros. from Winona, Minnesota, attended the Common Brick Manufacturers Association.

Bohnsack Brick is using a Bucyrus 175-B in their plant. Ed. Bohnsack claims that this shovel, with its great reach, gives them just the right mixture of clay.

Art Revore of Burnham Bros., Milwaukee, attended the brick convention.

Hamer-Paskins are just finishing a grade separation job at 49th and Kedzie. John Moor is the engineer of the Bucyrus 20-B. Observers state that it makes them dizzy to watch Moor change from dragline to clamshell and back again.

John Bransfield and Ed Johnson Sons are two contractors who have kept busy all winter. John Finn, too, has been on the job right along.

If you drive through South Chicago and the ground looks like the Iron range, why, Gentlemen, that's the Kruse Construction Co. putting in sewers. E. G. Soderberg keeps everybody on their toes.

Carmine-Roberts, who is putting in the Ogden Avenue sewer, says he should be wearing the Croix de Guerre. They have had to blast so much that every once in a while he begins to believe he is in the Argonne.

Markus Thompson of Kenosha are busy on the north side putting in sewers. They hit water in Niles Center, and J. C. Erixson, the superintendent, was tearing his hair. Says he wishes he'd gone in for something easy like drying up Lake Michigan with a spoon.

Pronger Bros. of Blue Island are raving to go. Will Pronger says "Bring on your jobs and let us at 'em."

Sherman Park Cartage Co. are finishing a subcontract under Kenwood Trucking Co. at 51st near Robey. This is a grade separation job and Fred Bissmer wields the big stick.

Noticed T. M. White's Thew digging a basement at 3800 West Harrison.

Palumbo Bros., Toney and Sam, keep their trucks moving along. These boys are expanding their business all the time, and with A. Ramacitti and Frank Trucco they put Italy on the map in the excavating business.

Lincoln Crushed Stone Co. of Joliet are constantly expanding. Mr. Greenberg says the Bucyrus 50-B keeps things moving along.

City of Harvey has a big sewer program for the coming year. As court proceedings are still going on, we can't give any more definite information. E. Hancock & Co. are the engineers.

Farr Bros., paving contractors, are keeping busy. They can always use more jobs, however. Just let them know and they will bid.

We manufacture brake and friction blocks for steam shovels, draglines and locomotive cranes of every manufacture; also for every type of hoisting equipment, including Lidgerwood, Mundy, Mead-Morrison, Flory, National, Orr and Sembower, Clyde, American, Thomas, Lambert, and others.

"Ektag," the Gatke Folded and Compressed Asbestos Brake Lining, is carried in stock in many sizes and lengths for immediate shipment.

As Good As Its Reputation

THE ENOS COAL MINING COMPANY

PRODUCERS OF

ENOS COAL

GENERAL OFFICES, ROCKEFELLER BUILDING

CLEVELAND O

MINE OFFICE

OAKLAND, CITY Ind. Jan 1st 1927

Mr. Thomas L. Gatke,
80 E. Jackson Blvd.,
Chicago, Illinois.

Dear Sir:

We have been using Asbesgraphite Moulded Blocks on both the check band and the hoist friction band on our 185-Bucyrus stripping shovel since May, 1925 and we have found that they are everything you claimed.

In addition to greatly extended service, we have found our delays are few and have dispensed with the breaking of brake and friction bands entirely.

These blocks hold securely, but are entirely void of grabbing and a light touch of the lever keeps the dipper in control of the operator constantly.

We are well pleased with the service these blocks are giving and you will hear from us when they commence to wear.

We are at present operating four strippers and have had a very successful year - hope to do better in 1927.

Wishing you a prosperous new year, we are,

Yours very truly,

The Enos Coal Mining Company

By Wm H Nichol
Gen'l Supt.

WHN-H

3 years service without Replacement

Asbesgraphite Is the World's Greatest Brake and Friction Lining.

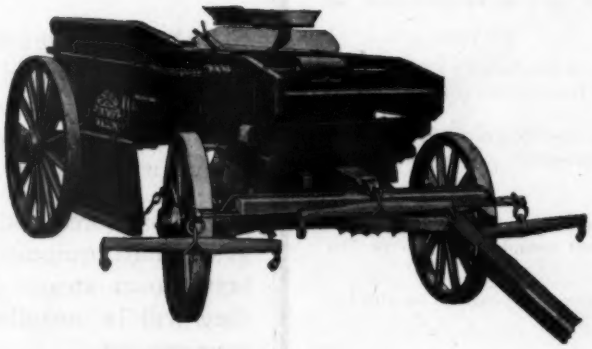
Manufactured by

THOMAS L. GATKE

Chicago Office: **Railway Exchange Building**
Factory: **Winona Lake, Indiana**

ASBESGRAPHITE
ASBESTOS COMPOSITION

THIS IS THE WAGON



Western *That's Why!*

The WESTERN Wagon, due to careful attention to details of construction, is the leading wagon among earth-moving contractors.

These are some of the features that make the WESTERN so popular:

A wide body and large doors for dumping.
Low height and low center of gravity.
Great strength and light draft.
Close coupled for easy turning.
Only best of material and workmanship used.

Notice the new three-up hitch and the drop tongue that protects your animals in rough going.

But you can't fully appreciate the WESTERN until you have used one.

Write Today.

Western Wheeled Scraper Company

Founded 1877

Builders of Dump Cars and Earth and Stone Handling Machinery

AURORA 1877 Western 1927 **ILLINOIS**

In writing to Western Wheeled Scraper Co. please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

Markgraf Stone of Joliet are looking around for more land. They are to the limits of their present property, and as their business is growing so rapidly they are in need of more space. They have a Bucyrus 18-B and a railroad-type to keep the crusher going. Mr. Nusmeyer is superintendent.

Eastern Notes

BY J. C. O'CONNOR

Contractors who wish to bid on a 40,000-yard rock job, should turn to page 159.

Work is about to be resumed in this locality after a rather wild winter. There is but little frost in the ground.

J. F. White Co., Cambridge, are excavating for another Harvard College building in Cambridge. Bob Gray is running an Erie "B" on the job.

Frank Lanza of Boston has again started on his specialty, basement excavation, having just completed a job in Dorchester.

T. Stuart of Newton is making fine progress on the Cottage Farm Bridge, Boston.

Greaney & Sherry plan to get off to an early start on their Taunton job. Prompt completion of this project will allow them to land some of the July letting jobs.

The Lawrence Portland Cement Co. is to install the plant for the New England Portland Cement and Lime Co. at Rockland, Maine. Operations will commence late in the spring.

Illinois Approves Chicago Suburban Water Supply Project

Thomas J. Dolan, secretary-treasurer of the Greater Chicago Lake Water Company, has announced that the Illinois Commerce Commission has approved their plans to supply water from Lake Michigan to towns within thirty-eight miles of Chicago city limits.

Under the plans, towns as far as Chicago Heights, Joliet, Elgin, and Lake Forest will be supplied with filtered lake water. Work on the project, estimated to cost about $35,000,000, will be started within a year, and will be completed in three or four years, it is said.

Alternative Plans Drafted

Two plans for taking the water from the lake are under consideration, Mr. Dolan asserted last night.

One of these plans calls for the construction of a crib in the lake off 22nd Street. A tunnel would then be drilled through solid rock 160 feet below street level to Harlem Avenue, where a large filtration plant with a pumping station would be built. From the pumping station the water would be distributed through large mains.

The other plan under consideration calls for the building of a crib off Glencoe, and the drilling of a tunnel straight west for two or three miles to a filtration plant and pumping station.

Mr. Dolan said the cost of water on completion of the project will range from 7 cents to 13 cents per 1,000 gallons, the rate to be determined largely by the distance from the pumping station to the user.

Michigan Notes

BY P. M. RICHARDS

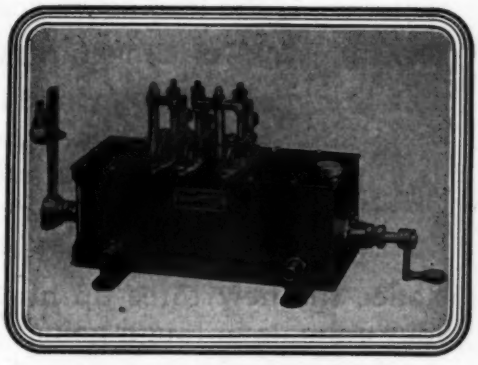
Work has been started on the grade separation where Michigan Avenue (Detroit) passes under the Pere Marquette Railroad and the Michigan Central Railroad. This separation involves both Michigan Avenue and Miller Road as the Pere Marquette crosses both. Al Duesing with his Bucyrus

A McCord Force Feed Lubricator Will Keep Your Shovel on the Job

A McCord force feed lubricator installed on your steam shovel now will insure more continuous operation. Dependable force feed lubrication prevents shutdowns and delays, it gives more hours on the job.

McCord force feed lubricators are used as standard equipment by the largest and best-known steam shovel builders and they will be installed on any shovel at your request.

Put a McCord lubricator on now and be assured of dependable lubrication for the life of your shovel.



McCord Class B. A. Force Feed Lubricator

McCord Radiator & Mfg. Co.
Detroit, Michigan

McCord
force feed
Lubricators

In writing to McCord Radiator & Mfg. Co. please use post card bound in the center of this number.

Diesel economy *for this giant dredge*

Moving 100,000 cubic yards per month — 294 cubic yards per running hour, this suction dredge, Powhatan, operates on low cost Diesel power with important savings. It is equipped with a Fairbanks-Morse Diesel Engine of 150 hp. direct-connected to 12-inch dredge pump, and also has a 60 hp. Fairbanks-Morse Diesel generating set. Owned by C. H. Hodges, Morehead, N. C.

Write for Bulletin 1010
"Economy of Diesel Engine Power"

FAIRBANKS, MORSE & CO., *Chicago*
28 branches throughout the United States at your service

FAIRBANKS-MORSE
DIESEL ENGINES

The Product F M *of Experience*

AOA00.1

SHOTS FROM THE FIRING LINE — Continued

30-B dragline has started the excavation for Duffy and Jutton who have the first section of this contract. They also have a Bucyrus 30-B shovel on the Schaffer Road and Pere Marquette separation.

S. A. Healy has moved his Bucyrus 50-B Diesel back on the job at Mount Clemens, Michigan. This machine is digging canals in a new residence section. The canals will make this the Venice of Michigan.

Mr. Williams and Mr. Beal of the Ray Sand and Gravel Company at Oxford, Michigan, used their Bucyrus 50-B to good advantage in erecting new conveyors at their plant during the winter.

Earl Neal, with Coolsaet Brothers' Bucyrus 30-B shovel, is breaking 28 inches of first for Emil Clauhout, who is following with their Bucyrus 41-B dragline on a big sewer in Melvendale. They are laying 72-inch concrete pipe with the Bucyrus 41-B.

The White Construction Company have made good headway on the Chase Road Sewer, having worked straight through the winter. D. E. Monagin is operator on the Bucyrus 50-B.

New York and Vicinity

BY H. C. DAVIS

Contractors who wish to bid on a 40,000-yard rock job, should turn to page 159.

Victor A. Pyles & Co., Brooklyn, Maryland, has been doing some work for the Southland Co. of Baltimore. The last two jobs completed, as this goes to press, are 25,000 cubic yards grading and excavating for residences on York Road and a smaller job of 3,000 cubic yards on First Street, Brooklyn. R. L. Myers is the foreman in charge; F. Boyle is the engineer and Fred Abrahams is the fireman.

On March 7, 1927, the Baltimore and Ohio Railway let contracts to the Vang Construction Company of Cumberland, Maryland, and to the Empire Construction Company of Baltimore, Maryland. This work is on the Metropolitan Branch of the Baltimore Division.

Pacific Coast Notes

BY P. H. BIRCKHEAD

Contract awarded to Bent Bros., 418 South Pecan Street, Los Angeles, who bid $1,440,375 for the construction of Bull Run storage dam and appurtenant works on the main Bull Run River, 10 miles east of the town of Bull Run, Clackamas County, dam to be concrete of the curved gravity type, 200 feet high and crest length of 1000 feet. Ben S. Morrow is chief engineer of city water department. City will furnish cement, valves and gates.

Bonds voted by the City of Newport Beach, Orange County, in the amount of $500,000 for the construction of an east jetty and to improve the west jetty at the entrance channel of Newport Harbor.

Contract awarded to Robert Metcalf, 1935 North Commonwealth Avenue, Los Angeles, who bid $335,000 for construction of Section No. 2, of Jefferson Street, storm drain system on portions of 8th Avenue, 13th Street, 6th Avenue, 7th Avenue, etc., for City of Los Angeles. Engineer's estimate was $386,460.

Plans by City Engineer C. L. Jenken, City Hall, Santa Ana, for improving portions of Fruit Street, Santiago Avenue, Logan Street, etc., work involving 98,000 square feet 6-inch asphalt pavement, 1,300 square feet 5-inch asphalt pavement, 2,772 square feet 3½-inch cement sidewalk, 1 manhole, 1

ease
of handling *means*
lower replacement
costs

The man on the job will tell you that just one of the many reasons why Tru-Lay Brand Preformed Wire Rope makes wire rope dollars go further is its ease of handling.

He knows from experience that its preformed construction resists unstranding and kinking and is not "cranky" — that it affords an added factor of safety.

Know all of the facts. Write today for the names of nearby users who will give you the benefit of their experience. We will also send you a sample and interesting literature. No obligation.

AMERICAN CABLE CO., Inc.
105 Hudson Street New York City

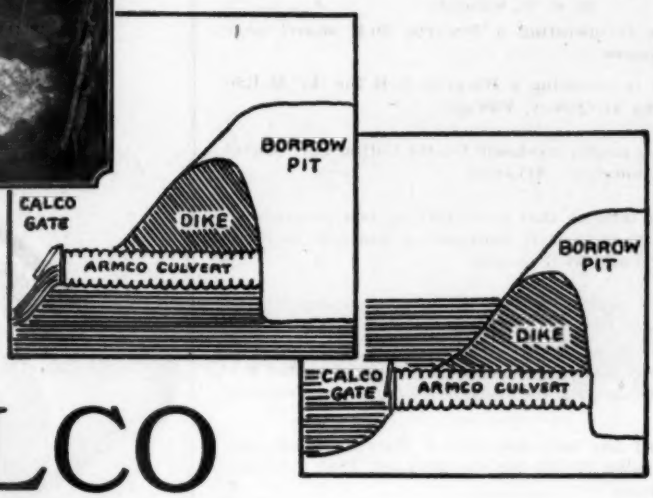
District Offices:
Chicago Cleveland Philadelphia Pittsburgh Tulsa

The Dominion Wire Rope Company, Limited, Montreal
Sole Canadian Licensed Manufacturers

PREFORMED WIRE ROPE

Trade **TRU-LAY** Mark

(Reg. U. S. Pat. Office)



CALCO GATES

will keep borrow pits dry

PROGRESSIVE road contractors know the value of keeping borrow pits dry so that they may be worked immediately after a storm.

Calco Gates provide a simple way to secure drainage — automatic, economical. This sensitive double-hinged gate can be used at the lower end of the borrow pit to exclude flood water and yet provide free outlet for normal drainage.

In the case of high water the Calco Gate closes tightly, preventing backwater from flooding the pit. But on the slightest excess of pressure inside of the pipe the gate swings wide on its double hinges allowing free flow from the pit.

Draining borrow pits is only one of the many profitable uses of Calco Automatic Drainage Gates for road contractors and excavators. An ARMCO Engineer will be glad to show you how these gates can be used to prevent backflow from floods or high tides—for rebuilding low lands and marshes — for controlling water levels in lakes and lagoons. There is no obligation.

ARMCO CULVERT MANUFACTURERS' ASSOCIATION.
MIDDLETOWN, OHIO

Forty modern Armco culvert plants in the United States and Canada assure you of prompt attention to your drainage requirements no matter where you may be.

ARMCO CULVERTS

Predominant in use — because predominant in quality

In writing to Armco Culvert Manufacturers Association please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

flushtank, 439 lineal feet 6-inch main sewer, 1 reinforced concrete culvert (70 feet long, 4 feet x 6 inches inside dimensions). Protests will be heard March 7. Work under the 1911 Improvement Act and the Bond Act of 1915.

Southern States Notes

BY W. W. WHORLEY

J. T. Moses is operating a Bucyrus 50-B shovel near Freemont, Tennessee.

E. C. Fuller is operating a Bucyrus 30-B for the McRae Lumber Company at Quincy, Florida.

W. E. Boyd is master mechanic for the Cotton Belt Gravel Company near Jonesboro, Arkansas.

J. B. Turner tells us that he is making fast progress on his work in Barbour County, Alabama, on which he is using his Bucyrus 20-B and 31-B shovels.

Roy A. Gillen writes us that he has been operating for J. B. Turner near Clayton, Alabama.

J. W. Luriesay writes us that he is now located in Chattanooga, after being with the Norfolk Construction Company in Kentucky.

R. F. Belford has been operating a Bucyrus 320-B electric shovel stripping lignite for the Malakoff Fuel Company at Malakoff, Texas.

Fred Branton advises us that he is handling a Bucyrus 18-B for the Bertha Mineral Company near Cartersville, Georgia.

C. D. (Danny) Hutton has been on a Bucyrus 70-C for Cornell-Young near Thomasville, Georgia.

G. H. Harden is operating an Erie for the W. J. Runyon Paving Co. at Sheffield, Alabama.

O. A. Keeling writes us from Atlantic City that he is anxious to get back into the stripping game, and would like to locate on a big shovel. He can be reached at 116 South Vernon Avenue, Atlantic City, New Jersey.

A. S. Dickson, who is well known to dragline operators, is now with the Roquemore Gravel Company at Montgomery, Alabama.

The D. A. Foley Construction Company at Los Angeles have been awarded a large yard job for the Texas & Pacific Railway at Fort Worth, Texas.

Reid & Lowe of Birmingham, Alabama, are getting started on their work for the Frisco Railway near Memphis, Tenn.

W. A. Taylor has installed a Bucyrus 31-B shovel on his highway job in Choctaw County, Alabama.

St. Louis Notes

BY B. R. ANDRES

The Callahan Construction Company are making fine progress on their River Des Peres job in St. Louis. Their Bucyrus 50-B steam shovel has made some excellent records.

George Pontarelli is preparing to resume work on his Evansville sewer job, and will be under way full steam by the latter part of March or first of April.

St. Louis Items

BY A. B. KOENIG

James Cameron and James Joyce of Cameron, Joyce & Co., Keokuk, Iowa, attended the meeting of the Highway Engineers Association of Missouri at the Missouri Hotel here.

This WILLIAMS Bucket doesn't show the hard work it has been through—

No distortion after hard work—looks new—no bent scoops.

When you look at a WILLIAMS Bucket at work on a crushed stone pile, or in a hard trench cut, or anywhere else—it doesn't take you long to realize that here's a bucket that *is a Bucket*.

One that's a fast powerful digger, with the durability to stand up under hard service.

Even if it's a veteran of many years' service, and has handled many thousands of yards of material, the scoops of a WILLIAMS have kept their shape—the lips still meet snugly, without any "off-set."

Our 25 years of experience, knowledge of what the bucket should *be* and should *do*, are at your service. Let us know what you have to dig or rehandle.

G. H. WILLIAMS COMPANY, 603 Haybarger Lane, Erie, Pa.

Branch Offices: New York, Pittsburgh, Chicago

WILLIAMS
FAST-DIGGING BUCKETS

Forget the Grades — Haul With Shays

The Shay Industrial Catalog will tell you what Shays are doing under conditions similar to yours. Write for a copy.

GRADES that are too steep for rod locomotives need not hamper your operations or unnecessarily add to track construction costs.

Haul with Shays and the grade problem is solved. Many Shays are operating on grades twice as steep as those possible with rod locomotives.

Are grades one of your hauling problems? Tell us about it and let us explain how Shays will improve your transportation.

LIMA LOCOMOTIVE WORKS
Incorporated

Lima, Ohio — 17 East 42nd St., New York

LIMA *Shay Geared* **LOCOMOTIVES**

SHOTS FROM THE FIRING LINE — Continued

John Costello, son of Richard Costello, was here taking back some help and supplies for their work on the Frisco Railroad in Alabama.

Cameron, Joyce & Co., Keokuk, Iowa, have 24,000 yards of highway work in Illinois suitable for a machine outfit to let.

The Dunn Construction Co. started on their paving contract in Durant, Mississippi, and will push this work as rapidly as possible to completion.

The Kaw Paving Co. were given contract to repair the Aggie and Nettleton Highway out of Jonesboro, Arkansas.

The Halpin-Boyle Construction Co. of Kansas City, Missouri, with a bid of $220,000, are low for construction work in sewer district No. 104, Little Rock, Arkansas.

Rosamond & Son, Hot Springs, Arkansas, submitted lowest bid for construction of paving in Benton, Arkansas, to link the two sections of the Little Rock-Hot Springs highway.

George Mathews, general superintendent, and Phil La Salle, engineer, of the Foundation Co., New York, are in Pekin, Illinois, starting work on the proposed Insull power plant and switch yards there.

Lowrance Bros. & Co. are working two big grading outfits on grading Road 15 between Bolivar, Tennessee, and the McNairy County line. Work is in charge of A. F. Sanford and V. A. Long.

The Frazier-Davis Construction Co. are low bidders for the construction of the Western Mill Creek Relief sewer here draining the district bounded by Newstead and Vandeventer Avenues, Duncan Avenue and North Market Street. This is the last branch of the Mill Creek sewer system. The tunnel will be 7200 feet long according to specifications.

G. P. Fleetwood of Hamer-Paskins Co., Chicago, spent a couple of days in town looking over things and getting posted on prices in this neighborhood.

Smith Bros., the successful Texas contractors, have an outfit working on highway in Jersey County, Illinois. J. C. Kelly is in charge.

Ed Molinder has a machine outfit at work on the Frisco Railroad extension near Columbus, Mississippi.

Contractors when in want of work or labor for their outfits get in touch with the Koenig Labor Agencies, 612 Walnut Street, St. Louis, Missouri, or 501 Delaware Street, Kansas City, Missouri.

Twin City District

BY J. C. YETTER

The Barnard-Curtiss Co., Minneapolis, Minnesota, were low bidders on a large drainage prospect at Crookston, Minnesota, on February 25th.

S. J. Groves & Sons, Minneapolis, Minnesota, were low bidders recently on approximately 1,000,000 yards of excavation in Maryland.

Bill Nolan of Nolan Bros. is reported getting along fine since his operation. We all wish him a speedy recovery.

T. J. Frederick and M. W. Barnard of Minneapolis are planning to spend a few weeks at West Baden, Indiana.

The State Highway letting at Eau Claire, Wisconsin, March 8th, was attended by a large number of contractors.

The death of Peter Ostrand came as a shock to his many friends. He was associated with the paving firm of Ostrand

52 miles in 68 days

The Foundation Company built this 52-mile steel pipe line for the Midway Gas Company of Los Angeles. It cost one million dollars.

Two Buckeye Ditchers cut all of this trench — and did it in 68 days. They kept so far ahead of the pipe crews that 5 to 7 miles of ditch was always open. It was necessary to provide uniformed patrols to safeguard traffic along the miles of highway close to the open trench.

The successful completion of this million-dollar job, under difficulties, is another triumph for The Foundation Company — *and for Buckeye!*

A Buckeye will do that kind of work for you. Write for literature that will help you select the right size Buckeye for your needs.

Prompt Shipment

The Buckeye Traction Ditcher Co.

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers.

Findlay, Ohio

There's a Buckeye Sales and Service Office near You

Buckeye FOR OVER 30 YEARS

In writing to The Buckeye Traction Ditcher Co. please use post card bound in the center of this number.

6-Wheel Contractor's Trailer

For Hauling Steam Shovels and Other Heavy Equipment

Showing Clear Space for Loading Over Rear End

This Trailer has a carrying capacity of 30 tons and can be loaded over the rear end as well as from either side. It is equipped with rubber tires, Timken bearings, and internal expansion brakes.

There are two wheels in front and four in the rear. It can be turned in its own length and a 5-ton truck will haul it with a 30-ton load.

Move Your Heavy Equipment Quickly and Safely with Your Own Trucks.

BUCYRUS COMPANY

SPECIALTY DEPARTMENT

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

In writing to Bucyrus Company please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

& Hallet, Crosby, Minnesota, and was highly respected by every one who knew him.

Washington, D. C., Notes

R. L. Rogers, an old Bucyrus booster, is running a Bucyrus 20-B for E. G. Gummel of Washington, D. C.

Asa Robinson is running a Marion 21 for Forbes and Johnson, Washington, D. C. They are putting in the Piney Branch Sewer.

Jim Stevens and R. N. Jarbo are running shovels for J. B. Latimer, Washington, D. C.

F. E. Boyd is working for B. B. Allen, Washington, D. C. He is running an Erie at 14th and Fairmount Streets, N. W., digging a cellar for the Washington Hall Apartments.

Slim Thompson and Red Burgman, engineers, are working for Warren F. Brenizer Co., Washington, D. C., on the Columbia Park Development.

Canada

Montreal and Vicinity

BY J. M. WARD

A $19,000,000 Canadian National Railways three-year building program will shortly be submitted to Parliament by Hon. Charles A. Dunning, Minister of Railways. The total proposed new mileage is 470.2. The program is made up as follows: St. Felicien to Mistassini River, Lake St. John District, Quebec, 27.3 miles, cost $1,463,000; Hebertville to Savanne Falls, Lake St. John District, Quebec, 34.5 miles, $2,132,000; Grand'Mere to East Burrills, Quebec, 7.9 miles, $1,683,000; Pilkington to Niagara Junction, Ontario, 16.7 miles, $1,164,000; Willowbrook northwesterly, Saskatchewan, 22 miles, $616,000; Weyburn to Radville, Saskatchewan, 22.7 miles, $570,000; Sturgis to near Peesane, Saskatchewan, 100 miles, $3,395,000; Peesane northerly, Saskatchewan, 19 miles, $570,000; Shellbrook or near Parkside, westerly, Saskatchewan, 37 miles, $1,200,000; Turtleford southeast Mile 67, to between Hafford and Richard, Saskatchewan, 35.6 miles, $1,130,000; Kindersley to Glidden, Saskatchewan, 18 miles, $640,000; Spruce Lake (near), westerly, Saskatchewan, 29.5 miles, $990,000; Hudson Bay Junction, southerly to meet proposed Sturgis-Peesane line, Saskatchewan, 32 miles, $1,088,000; Elk Point easterly, Alta, 19 miles, $745,000; Ashmont to Bonnyville, Alta, 38 miles, $1,415,000; Bretona to Clover Bar, Alta, 11 miles, $319,000.

The Quebec Power Corporation may proceed this year with the development of hydro-electric power at Back River, Montreal. This is a seven-million-dollar proposition.

Contracts for the Quebec Highways are expected to be let within the next few days. There is about a million dollars worth of work to be awarded.

We had a visit from Messrs. Gorman and Peckham and also from Wm. Cooke of the Cooke Construction Company. They all expect to be very busy this summer.

There is a large job expected to come out within the next couple of weeks which will run into several million dollars. Contractors are getting lined up to bid on same.

Western Union expect to build large pier for their cables at Halifax, Nova Scotia.

City of Three Rivers, Quebec, contemplates spending $700,000 on paving, sewers and waterworks.

The Town of Greenfield Park, near Montreal, contemplates spending $110,000 on new water line extensions.

YOU SELECT your equipment for its adaptability to your work.

For its power — speed — durability — rugged strength — efficiency.

Do not all of these depend upon the boiler?

Can you afford to consider anything less than the very best?

DO YOU LOOK FOR

JOHNSTON BROS., Inc.

Specializing in Boilers for Contractors' Equipment

FERRYSBURG, MICHIGAN

In writing to Johnston Bros., Inc., please use post card bound in the center of this number.

ONE PRINCIPLE FOR TWENTY YEARS

PITTSBURGH

Extension Side Dump Cars will be furnished with all of their highly developed mechanical and balanced features in any size or design to meet your operating requirements.

Let us make a survey of your operation and report to you on the labor cost saving possibilities of our car in your service.

CLARK CAR COMPANY
BALANCED DOOR DUMP CARS
PITTSBURGH, PA.

San Francisco, Rialto Building — Minneapolis, Baker Building — Chicago, 400 Railway Ex. Bldg.
Richmond, Va., Am. Nat. Bank Bldg. — New York, 52 Vanderbilt Ave. — Boston, 683 Atlantic Ave.
European Agents: Figee & Groenevelt, Verspronckweg, 20, Haarlem, Holland.

BE SURE

The consistent performance of Taylor-Mesaba Chain on Steam Shovels and Draglines giving maximum production at low cost per yard handled make it the most economical.

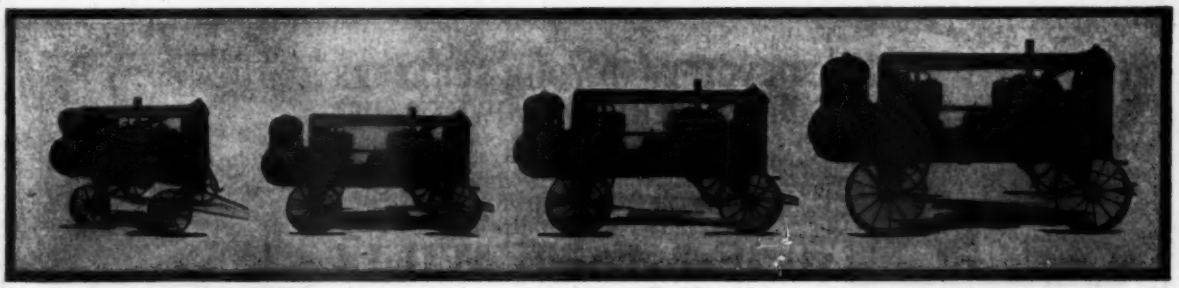
Specify Taylor-Mesaba Chain and BE SURE of steady production.

"BEST BY TEST"

S. G. TAYLOR CHAIN CO.

Established 1873

502 Marquette Bldg., CHICAGO, ILL.



60 Cu. Ft. — 120 Cu. Ft. — 180 Cu. Ft. — 240 Cu. Ft.

For Truck Mounting

Direct-Connected Motor Drive

For Semi-Portable or Stationary Installation

Stepping Them Up—

Built in four sizes with displacements of 60, 120, 180 and 240 cubic feet, "SCHRAMM" multi-cylinder engine-driven compressors cover all requirements of the field.

SCHRAMM, Inc., *Manufacturers,* **West Chester, Pa.**
Offices and Representatives in All Important Cities.

SCHRAMM

SHOTS FROM THE FIRING LINE — Continued

Toronto and Vicinity

BY C. F. ENGLAND

The Ontario Good Roads Association had a very large attendance at their annual meeting held at the Highways Administration Building, Toronto. This convention is getting to be more of an event each year.

Things are getting brisk at Windsor and the border cities. Contracts have been let for different buildings, among which is an hotel and a large office building.

John M. Taylor is making good progress on tunnel sewer job for City of Hamilton.

Sullivan & Fried have been awarded contract for the construction of the eastern entrance to the Canadian National Exhibition Grounds at Toronto.

Winnipeg and Vicinity

BY D. V. REDDIN

Clement K. Quinn Iron Company, Duluth, Minnesota, are operating the Mountain Stone Company's property at Fort William, Ontario. A quantity of second-hand machinery has been purchased in the United States, including a Bucyrus shovel and is now on hand ready for installation. Mr. J. C. Henry is in charge at Fort William.

A Bucyrus 30-B Diesel dragline will be put into commission on the Hudson's Bay Railway immediately weather is favorable. Ditches were cleaned out last season as far as Mile 187. John McBeth, the operator in charge, reports even better results in fuel consumption than anticipated. He is very much disappointed that some of the snapshots he took of the machine digging in snow with the temperature around 30 below zero did not develop properly.

The three prairie provinces will all have a big road-building program this year. The large portion of the work, however, will be in the way of grading up dirt roads.

W. S. Williams, inspector of work equipment on the Canadian National Western Lines, has taken a trip to South Milwaukee and Evansville. "Bill" will certainly enjoy meeting the various members of the staffs at both places, and we know they will enjoy meeting "Bill."

Spring work is evidently on the verge of opening up. Mr. W. A. Dutton has just returned from California, also Mr. W. S. Tomlinson. The latter left almost immediately for Montreal.

Fred Mannix, Don Grant, Stephenson, Ed. Ward, "Doc" Wilmot, Gus Wickstrand and Roos and their other associates are all in Winnipeg, so there should be something doing shortly.

TRADE NOTES

A new motion picture film showing the construction work on the Eighth Avenue subway system in New York City has just been released by *E. I. du Pont de Nemours & Company of Wilmington, Delaware.* This film, which is entitled "Building New York's Newest Subway," is printed on safety stock, is one reel in length, and requires 15 minutes for showing.

The film is a veritable trip along the line of operations as it shows not only scenes underground where great ledges of rock are being blasted away in the tunnels but also work

CAN YOU LOAD YOUR SCRAPERS GOING EITHER UP OR DOWN GRADE?

Can You Unload Your Scrapers over the edge of embankment while backing up, going either up or down grade?

THE MIAMI WILL!

The Miami, one-man operated, Power Scraper is the most versatile tractor scraper made, due in large measure to the fact that the load is carried on wheels to the dump, allowing ease of movement in all positions and especially in backing with full load.
The powerful Miami Winch, together with the tractor power does all the work. The driver needs only operate a convenient clutch lever.
In addition to operating the scraper the powerful winch has been adapted to a backfiller extension that is being very successfully used in filling trenches, building berm and cleaning ditches.

$390 Tractor Trailer

COMPLETE WITH

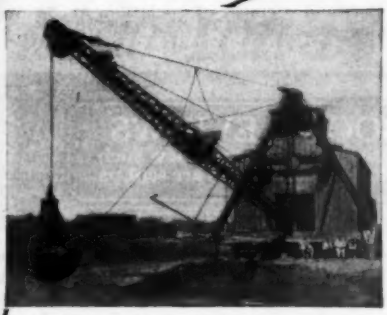
All Steel Bottom Dump or Sectional Stake Platform Body; Timken Roller Bearings; Alemite Wheel Lubrication; Two and a Half Tons Capacity; Turns in Its Own Length; Used with Any Type Tractor. Dump Trailer has 60-inch x 38-inch Bottom Opening.

This is exactly the Trailer you have been wanting. It meets price and gives features never before found in a trailer at this price level. Dozens of orders placed with us for both domestic and export shipment within a few weeks after the first premature announcement and before the trailer was released for production assure us that it is indeed "The Trailer That You Have Been Waiting For."

Write today for Miami's Liberal Trial offer and complete details of these three money savers together with name of our nearest jobber.
Stock and repair parts in over 20 cities.

THE MIAMI TRAILER SCRAPER CO.
603 S. CLAY STREET TROY, OHIO

In writing to The Miami Trailer Scraper Co. please use post card bound in the center of this number.



Builders of Buckets—
Clam Shell, Orange Peel, Drag Line, Electric Motor.

Machinery—
Dredging, Excavating, Coal Handling, Counterweight Drums, Automatic Take-Up Reels.

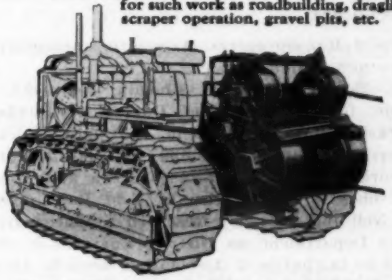
UNDER water, to any depth, in any soil, Hayward Buckets give "full measures" of service—year-in and year-out. They are fitted to the job. From the complete line of Hayward Buckets you will find one exactly suited to your needs.

THE HAYWARD COMPANY
52-54 Church Street
New York, N. Y.

Hayward Buckets

—instant rugged power for construction work

Mounted on the Caterpillar "60" or "30" tractors, these heavy duty Willamette Hoists develop from 14,000 to 29,500 pounds pull. Self-propelling—make own roadway. Two speeds. A practical unit for such work as roadbuilding, dragline scraper operation, gravel pits, etc.



Two Speeds

WILLAMETTE IRON & STEEL WORKS, PORTLAND, ORE., U. S. A.
Dealers Everywhere

Willamette automotive hoists

ALLISON FOR THE FORDSON ~ WILLAMETTE FOR THE CATERPILLAR

Winter Drilling

ON many rock jobs it is an advantage, if not a necessity, to continue drilling operations throughout the winter, even though the balance of the outfit may shut down for a month or two. This will provide drilling and blasting ahead for the Spring rush.

Winter drilling has no terrors for Cyclone No. 14 Big Blast Hole Drills. Their positive control in the form of a back-geared spudder, a geared hoist and worm-and-gear cable feed is not affected by wet and freezing weather as is the case with friction drives. Furthermore, the gears are Cast Steel, which does not become brittle in extremely cold weather as does cast iron.

These are some of the reasons why Cyclone Drills dominate in localities where the winters are severe, such as the Lake Superior Iron Ore district and in the Canadian limestone quarries. The illustration below, taken in February, shows seven of the twelve Cyclones used by Canada Crushed Stone Company at their Dundas, Ontario, quarry.

Our 100-page catalogue "BIG BLAST HOLE DRILLS" should be in the hands of every open-cut rock mover. Ask for it.

THE SANDERSON-CYCLONE DRILL CO., Orrville, Ohio, U.S.A.

Eastern and Export Office: 30 Church Street, New York, N. Y.

In writing to the advertisers on this page please use post card bound in the center of this number.

TRADE NOTES — Continued

in the open trenches and cuts. How windows are safeguarded from vibration caused by blasting, how monuments are propped up, and how telephone and electric cables are kept in operation, are pictured in the reel, as are the great tools used in the work, such as telfers, caterpillar shovels, powerful trucks and steam hoists. Scenes showing how explosives are used and stored on the job are interesting features. Other views show partially finished sections where the steel frame work is in place.

This film may be obtained upon application to the *Publicity Bureau of E. I. du Pont de Nemours & Company of Wilmington, Delaware.*

Armco Culvert Manufacturers' Association announces the opening of two new district offices.

A district office is opened at Lincoln, Nebraska, with Mont C. Noble, formerly Chief of Bureau of Roads and Bridges, Nebraska State Department of Public Works, as District Engineer in charge. This office will be in charge of Association work in Nebraska, Kansas, Iowa and Missouri.

A district office is opened also at East Point, Georgia, with Tom M. Neibling, formerly Research Engineer, Georgia State Highway Department, as District Engineer in charge. This office will be in charge of Association work in Alabama, Florida, Georgia, Louisiana, Mississippi, Tennessee, North Carolina, and South Carolina.

Announce Abrams' Resignation

The Portland Cement Association announces with regret the resignation of Duff A. Abrams, for many years Director of the Research Laboratory. Professor Abrams inaugurated the present-day research in concrete when he took charge of the Structural Materials Research Laboratory in 1916. The research program, then begun, was supported by co-operation of Lewis Institute and Portland Cement Association. This joint arrangement continued until May 1926, when the Research Laboratory was installed in the new headquarters building of the Portland Cement Association at 33 West Grand Avenue, Chicago.

BOOK REVIEWS

We shall be glad to review such books and catalogs as are sent us

The Miami Trailer-Scraper Company, Troy, Ohio, has just published a 12 x 18½ mailing piece in two colors describing uses for the Miami Back Filler. It illustrates and describes a number of uses for this new piece of equipment brought out by the Miami Trailer-Scraper Company of Troy, Ohio. A copy may be obtained by writing the manufacturer.

LINCOLN "STABLE-ARC" WELDER INSTRUCTION MANUAL — 5¼ x 7¾, 96 pages and cover, illustrates and explains the installation and maintenance of the Lincoln "Stable-Arc" Welder, with nine lessons in arc welding and methods of procedure for standard operations. Price $1.00 from the *Lincoln Electric Company, Cleveland, Ohio.*

Radiators any size, any type! from 1-H.P. up

Radiators of any size, 1 H.P.—1000 H.P. or more; Tubular or Cellular—Sectional or Conventional Cast—Sheet Metal—or if preferred only the cores or sections.

MODINE MANUFACTURING CO., RACINE, WIS.

MODINE RADIATORS

Roebling

"Blue Center" Steel Wire Rope

Famed for

Dependability - Strength
Endurance

John A. Roebling's Sons Co.
Trenton, N. J.

Do You Need Men Who Know? Do You Need To Know?

To the manager or superintendent who wants men who know, and to men who want to know, this advertisement is addressed.

Much of the most useful knowledge disseminated to the mining, quarrying and construction industries, is disseminated by The Explosives Engineer. Realizing this, many companies have sent in subscriptions for all their key men who ought to know about progress in accident prevention, new methods of drilling, loading, and blasting, and matters of scientific interest in the industries that move materials with explosives.

Realizing this also, many engineers, superintendents, foremen, and blasters, who are ambitious to succeed, are subscribing to The Explosives Engineer in order to keep abreast of the latest developments in important phases of their business.

The Explosives Engineer is edited for men who want to know how the other fellow solves the problems he is facing. It contains numerous authoritative articles by the men who are actually engaged in important capacities, by successful firms. You can't keep up-to-the-minute without this publication.

If you are an employer, you can increase the efficiency of your employees by placing The Explosives Engineer before those men who can benefit by reading it. If you are an employee, you can make yourself more valuable to your employers by studying The Explosives Engineer.

It will cost less than three cents a month for each subscription. For free sample copies cut the coupon below now, and mail it with your list of names, at once.

THE EXPLOSIVES ENGINEER

WILMINGTON *Published Monthly* DELAWARE

Send This Coupon with Your List to Receive Free Sample Copies

THE EXPLOSIVES ENGINEER,
949 Delaware Trust Bldg.,
Wilmington, Delaware

SUBSCRIPTION RATES

United States—3 yrs.	$1.00	1 yr. 50c
Other Countries—3 yrs.	2.00	1 yr. $1.00

Please send a free sample copy of The Explosives Engineer to each name on the list that accompanies this coupon.

Name.....

Firm.....(*Position*).....

Street.....

City.....(*State*).....

P.S. Check the names of the men on your list for whom subscriptions are desired so that they will not miss the next issue and specify whether three-year or one-year subscriptions are preferred. A bill for the proper amount will be sent to you later.

In writing to Explosives Engineer please use post card bound in the center of this number.

Diesel Dragline Owned by S. A. Healy, at Work on One of the Canals of the St. Clair Haven Subdivision.

Looking down along one of the canals at the St. Clair Haven Subdivision. The machine in the foreground is pulling the spoil back and spreading it evenly, and the machine in the background is digging canals.